

Date: Thursday, 08/05/2008 8:34:01 AM  
 User: Julie Lecocq

## Process Sheet

<b>Customer</b> :	CU-DAR001 Dart Helicopters Services	<b>Drawing Name</b> :	HIGH AFT X-TUBE 412
<b>Job Number</b> :	39112		
<b>Estimate Number</b> :	10559		
<b>P.O. Number</b> :		<b>Part Number</b> :	D412664203
<b>This Issue</b> :	08/05/2008	<b>S.O. No.</b> :	
<b>Prsht Rev.</b> :	NC	<b>Drawing Number</b> :	D412-664-243 REV D
<b>First Issue</b> :	//	<b>Project Number</b> :	N/A
<b>Previous Run</b> :	39111	<b>Drawing Revision</b> :	D
		<b>Material</b> :	
<b>Written By</b> :		<b>Due Date</b> :	30/05/2008
<b>Checked &amp; Approved By</b> :	JLD 08.5.08	<b>Qty:</b>	1 Um: Each
<b>Comment</b> :	Est Rev:E 04.02.16 Reformat; Added D3189-1 K/DS Est Rev:F 06-03-29 Remove Comments on Pick List JLM Est Rev:G 06.12.08 per ECN 886 EC Est Rev:H 07-04-30 As per Rev D JLM		

## Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description :
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1.0	DC	DOCUMENT CONTROL
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Comment: DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D412-664-203 CHG 006

2.0	PACKAGING 1	PACKAGING RESOURCE #1
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Comment: PACKAGING RESOURCE #1

3.0	D412664203TRN	CROSSTUBE TURNING DETAIL
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Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

CROSSTUBE TURNING DETAIL

batch B39074

EL 8-5-26

4.0	BENDING	BENDING MACHINE - SKIDTUBES
-----	---------	-----------------------------



Comment: BENDING MACHINE

Bend tube as per Dwg D412-664-243 using CNC bender program 412-af and Folio FT010

EL 8-5-27

5.0	QC15	DIMENSIONAL CHECK OF X-TUBES
-----	------	------------------------------



Comment: DIMENSIONAL CHECK OF X-TUBES

see Dim  
sheet

PTC

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Date: Thursday, 08/05/2008 8:34:01 AM  
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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 39112

Part Number: D412664203

Job Number:



Seq. #:	Machine Or Operation:	Description :
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6.0

CROSSTUBES

CROSSTUBES RESOURCE #1



Comment: LANDING GEAR RESOURCE 1

1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551

2-Ream hole to finish size in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

8.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

9.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

10.0

OUTSIDE SERV.10

OUTSIDE SERVICES -skids



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038 Or

Issue P/O: \_\_\_\_\_ LPI as per ASTM 1417

Level 2 Attach copy of NDT results to work order

11.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage

Ensure copy of NDT results attached to work order.

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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Date: Thursday, 08/05/2008 8:34:02 AM  
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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 39112

Part Number: D412664203

Job Number:



Seq. #:	Machine Or Operation:	Description :
---------	-----------------------	---------------

12.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: Inspect for damage & ensure results are as per Dwg D412-664-203

13.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

14.0

QC14

INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Wrap in plastic bag to protect from scratches

15.0

D3595063570

RUBBER CUSHION



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Rubber Cushion

Batch: \_\_\_\_\_

16.0

D2856600

Abrasion Strip



Comment: Qty.: 1.7640 f(s)/Unit Total : 1.7640 f(s)

Pick:

Qty Part number Description Batch

2 D2856-600(Cut to 10.090") Abrasion Strip \_\_\_\_\_

17.0

D28961

Support



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Pick:

Qty Part number Description Batch

1 D2896-1 Support \_\_\_\_\_

18.0

D31891

Chafing Shield



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Pick:

Qty Part number Description Batch

2 D3189-1 Chafing Shield \_\_\_\_\_

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 39112

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

19.0

MS2192028

Clamp(per MIL-DTL-8783C)



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Pick:

Qty Part number Description Batch

4 MS21920-28 Clamp \_\_\_\_\_

20.0

MS2192030

clamp(per MIL-DTL-8783C)



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

clamp(per MIL-DTL-8783C)

batch: \_\_\_\_\_

21.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

Assemble as per Dwg D412-664-203

1- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe

2-Install supports with magnobond as per QSI 015 Adhere for for 12 Hrs

A/R 6398 Magnobond Batch: \_\_\_\_\_

Expiry Date: \_\_\_\_\_

3-Install clamps as per Dwg D212-664-141. Torque clamps to 80-100 in lb.

22.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

23.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Pick Packing Kit

24.0

AN640A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Bolt

Batch: \_\_\_\_\_

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 39112

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

25.0

AN641A

Bolt



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Bolt

Batch: \_\_\_\_\_

26.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total : 18.0000 Each(s)

Washer

Batch: \_\_\_\_\_

27.0

MS21042L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total : 6.0000 Each(s)

Nut

Batch: \_\_\_\_\_

28.0

QC4

INSPECT 100% KITS FOR COMPLETENESS



Comment: INSPECT 100% KITS FOR COMPLETENESS

29.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and pack for shipping as per PPP D412-664-203

\*\*\*\*\*Ensure tube is not packaged if curing time is less than 12 hrs, see step 27 for application time & date

\*\*\*\*\*

Time & date of packaging: \_\_\_\_\_

Location: \_\_\_\_\_

PPP Rev: \_\_\_\_\_

30.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

Job Completion



MF 08-05-29

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b> 39112
<b>Description:</b> Crosstube Assembly (412 High Aft)	<b>Part Number:</b> D412-664-243
<b>Inspection Dwg:</b> D412-664-243 <b>Rev:</b> D	<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article
 ☐ Prototype

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.684	+0.005/-0.000					
	2.748	+0.005/-0.000					
	2.884	+0.005/-0.000					
	3.019	+0.005/-0.000					
	3.163	+0.005/-0.000					
	3.308	+0.005/-0.000					
	3.429	+0.005/-0.000					
	2.990	+0.005/-0.000					
	2.618	+0.005/-0.000					
	0.200	+/-0.010					
	R0.063	+/-0.010					
	R0.500	+/-0.010					
	4.971	+/-0.030					
SIDE B	2.684	+0.005/-0.000					
	2.748	+0.005/-0.000					
	2.884	+0.005/-0.000					
	3.019	+0.005/-0.000					
	3.163	+0.005/-0.000					
	3.308	+0.005/-0.000					
	3.429	+0.005/-0.000					
	2.990	+0.005/-0.000					
	2.618	+0.005/-0.000					
	0.200	+/-0.010					
	R0.063	+/-0.010					
	R0.500	+/-0.010					
	4.971	+/-0.030					
	124.09	+/-0.020					

<b>Measured by:</b>		<b>Audited by:</b>		<b>Prototype Approval:</b>	N/A
<b>Date:</b>		<b>Date:</b>		<b>Date:</b>	N/A

Rev	Date	Change	Revised by	Approved
A	04.06.16	New Issue (P/O D412-664-203)	KJ/JLM	
B	06.03.09	Dwg Rev updated	KJ/JLM	
C	07.05.08	Tolerance updated for dimension 4.971	KJ/JLM	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

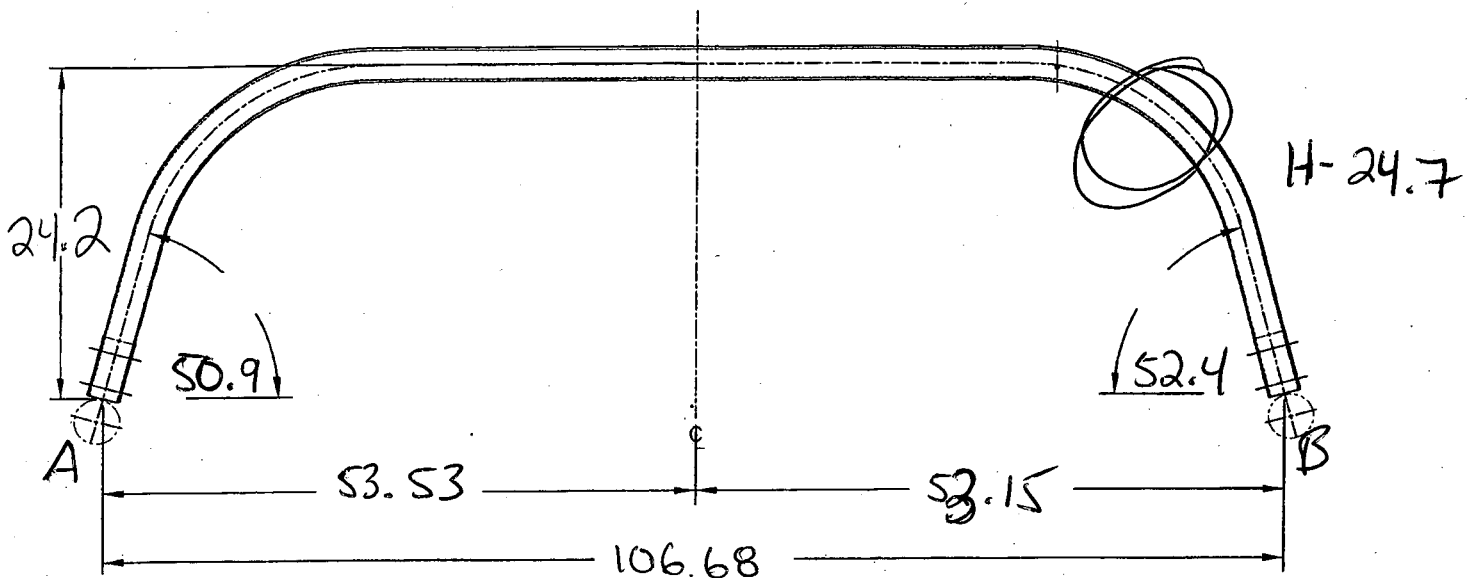
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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	39112
Description: Crosstube High Aft (412)		Part Number:	D412-664-203
Inspection Dwg: D412-664-243 Rev: D		Page 1 of 1	

Required Dimension	Min	Max
Height	24.24	24.50
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.70

24.37  
53.72



Comments
Tube is overbent by 0.57" 0.33" high on side B


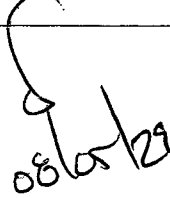
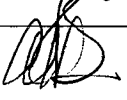
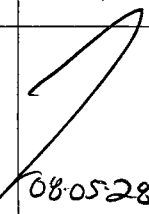
PTO

QC15 Inspection	
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	07.05.08	Dimensions updated per Dwg rev. D	KJ/JLM	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D412-664-203 PAR #: N/A Fault Category: Pod / x-tube NCR: Yes No DQA: D Date: 08/05/29  
 QA: N/C Closed: D Date: 08/05/30

NCR: 39112		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
08-05-28	4.0	Tube is .57" over bend on one side and is too high. R.C. Operator ran the wrong program. Ran A 3.5" dia. program, with 3.25" rollers. Lack of attention and did not reset of check program prior to running.		tube is scrap.	H 8-5-29	 08/05/29		 08-05-28

NOTE: Date & initial all entries

**DART**

DESIGN <b>PH</b>	DRAWN BY <b>PH</b>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <b>QP</b>	APPROVED <b>[Signature]</b>	DRAWING NO. D412-664-243	REV. D SHEET 1 OF 3
DATE 07.03.09		TITLE CROSSTUBE ASSEMBLY (412 HI AFT) NTS	
A	01.10.17	NEW ISSUE	
B	05.02.04	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	
C	06.10.27	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398 MS21920-32 WAS MS21920-30	
D	07.03.09	REMOVE D2732-058, CHANGE TO D3595-063-570	

**RELEASE**07.04.24 **[Signature]**

Qty	Part Number	Description
X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
1	D6009-129	CROSSTUBE
2	D3595-063-570	RUBBER CUSHION
1	D2896-1	SUPPORT
2	D2856-600-1009	ABRASION STRIP
4	MS21920-28	CLAMP
2	MS21920-30	CLAMP (OR MS21920-32)
2	D3189-1	CHAFING SHIELD
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION/RBO-120-023 ADHESIVE (TEXTRON/BELL/SPEC. 299-447-100, TYPE II, CLASS 2 ADHESIVE)

**GENERAL NOTES:**

- 1) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 2) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 124.09±0.020
- 3) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART 005 4.2
- 4) PART IS SYMMETRIC ABOUT CENTERLINE.
- 5) RUN-OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 6) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 7) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 8) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 9) INSTALL D2856-600-1009 ABRASION STRIP WITH A 0.13 (REF) GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 10) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 11) APPLY A 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 12) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE CROSSTUBE SUPPORT.
- 13) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

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RETURN TO  
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UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. **39112**

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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

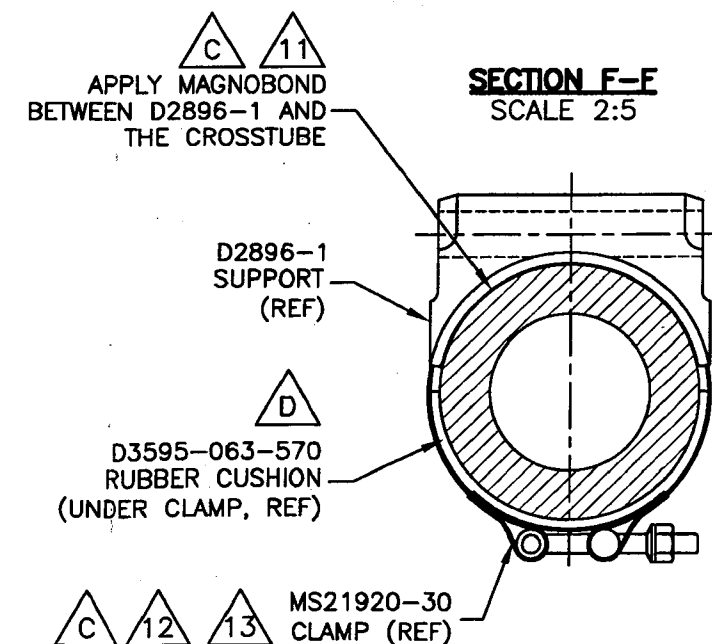
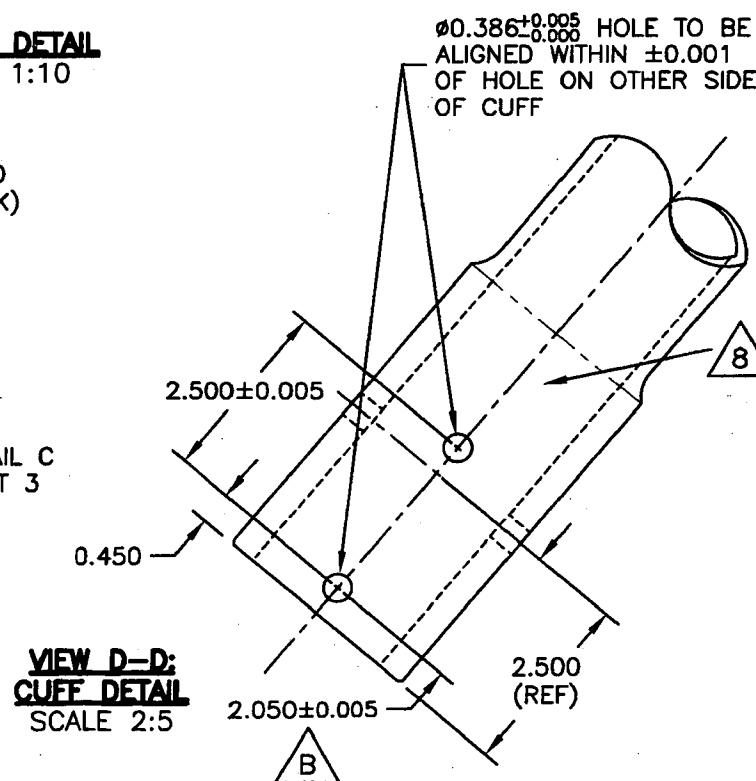
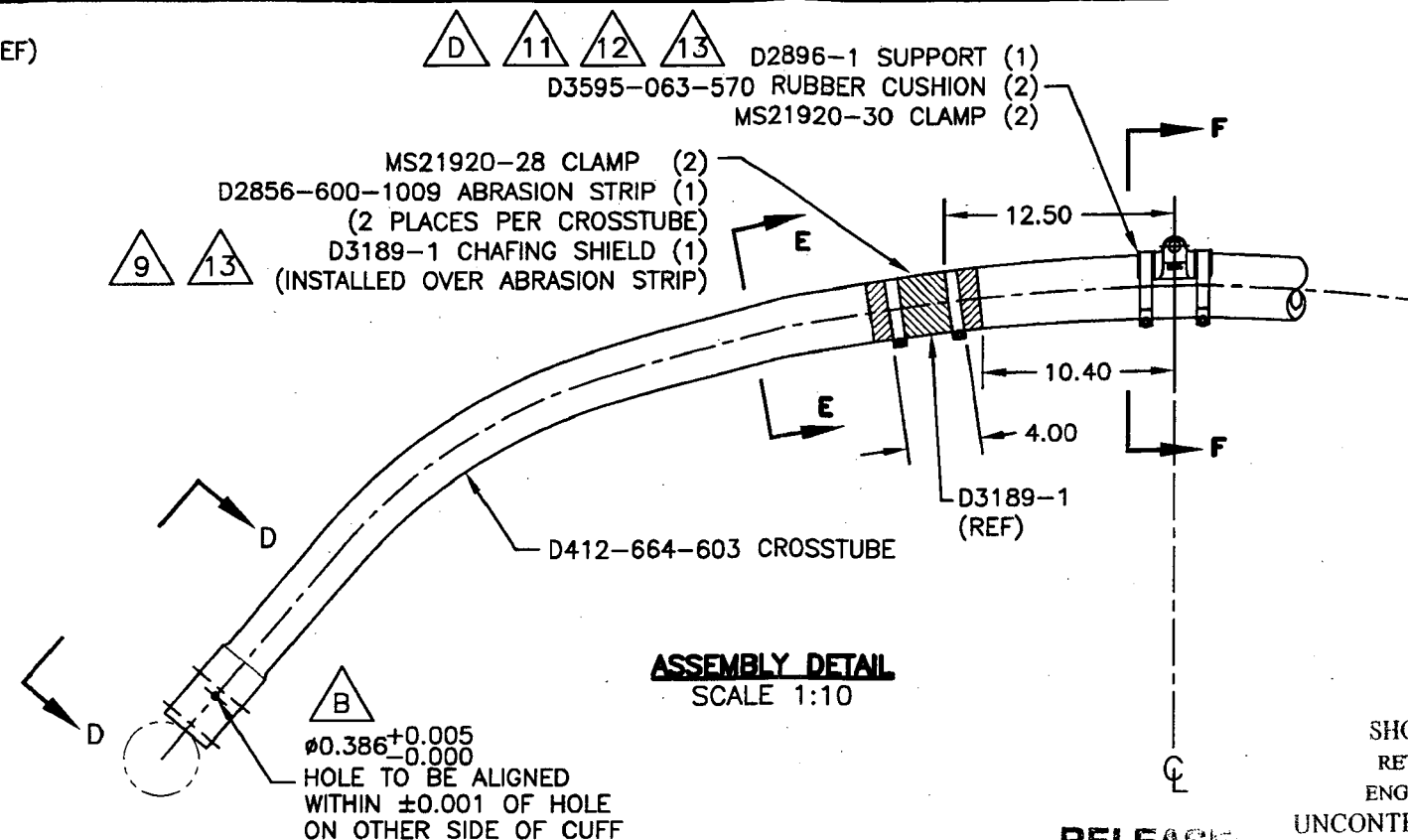
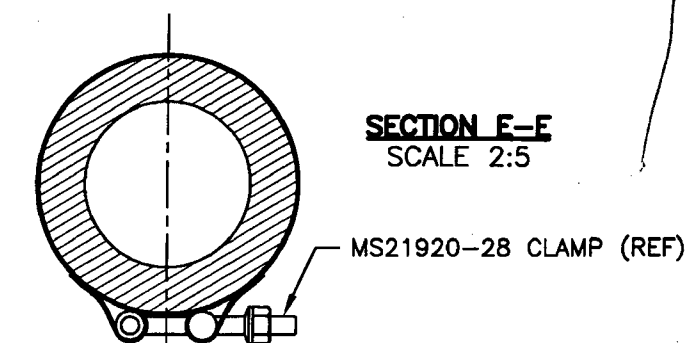
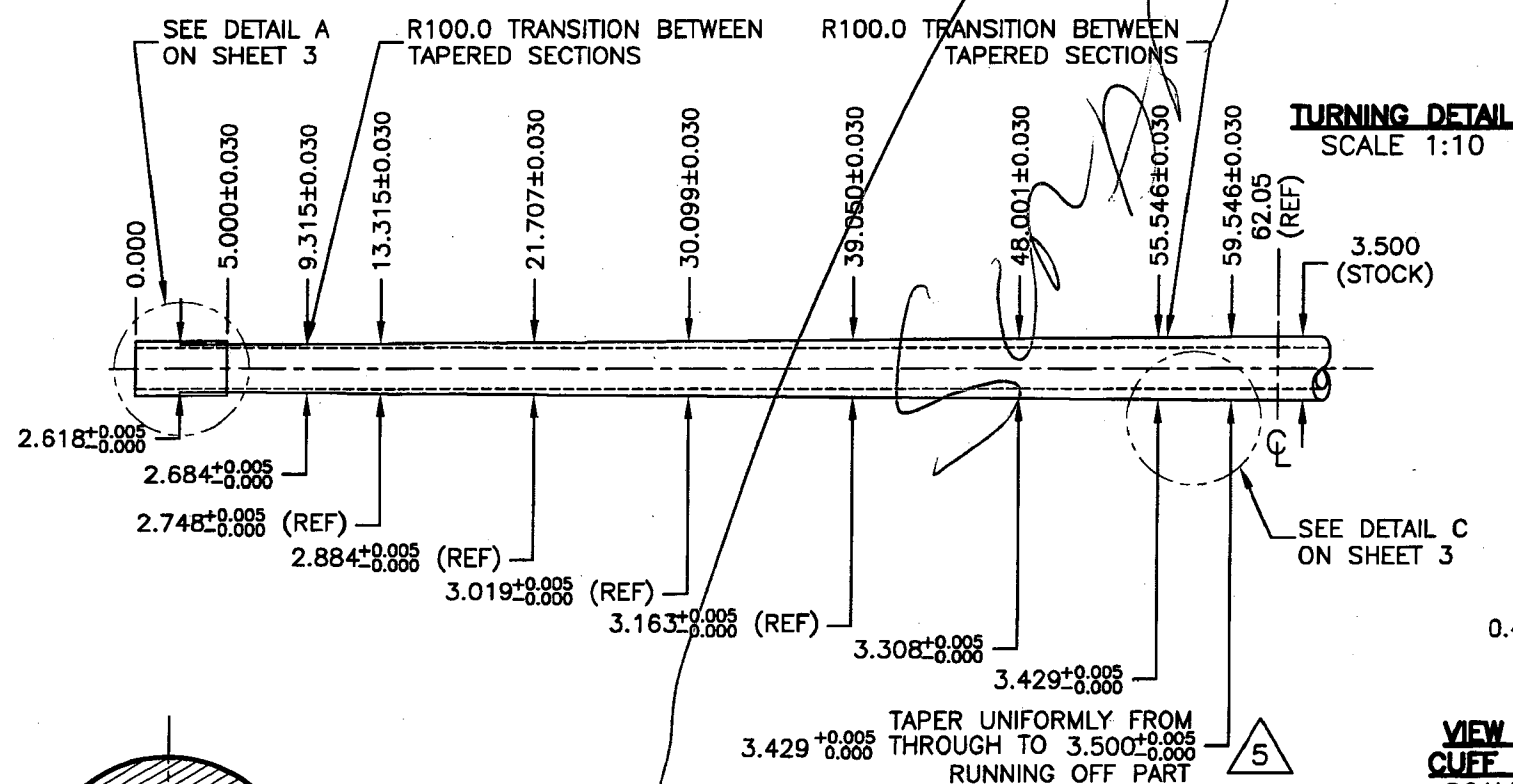
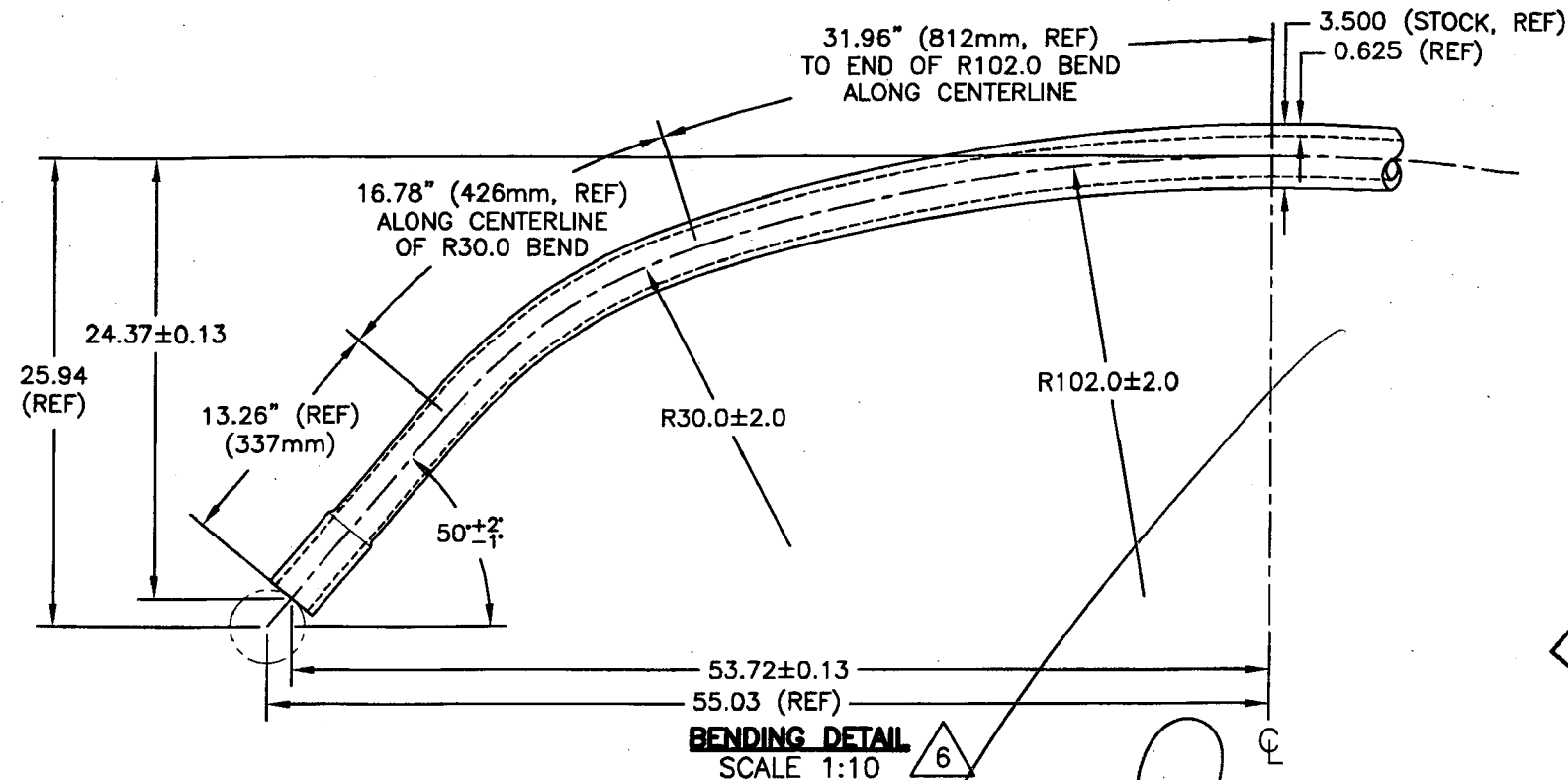
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

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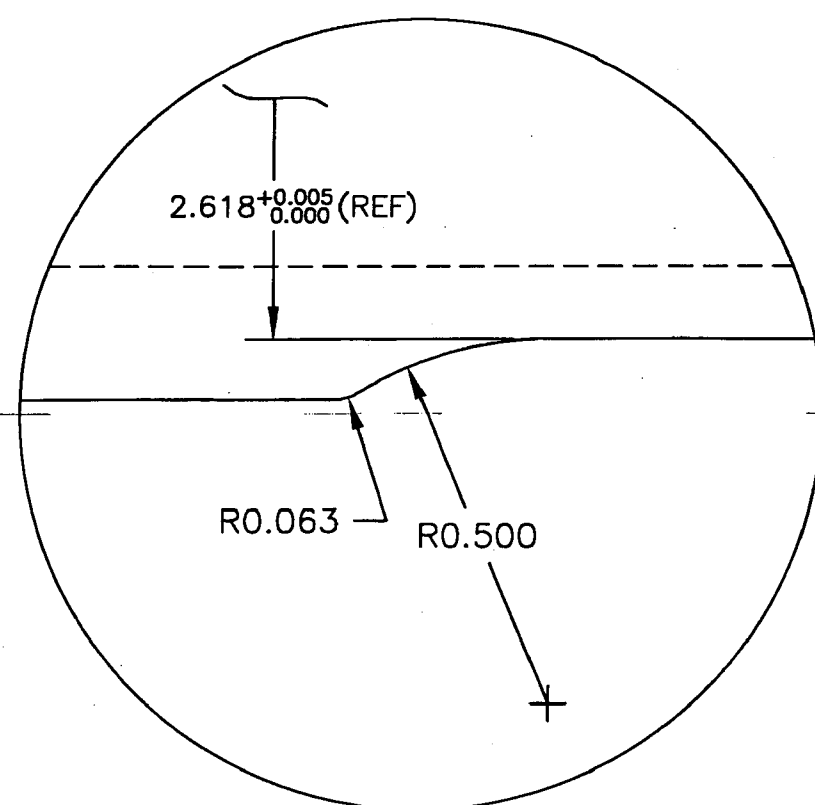
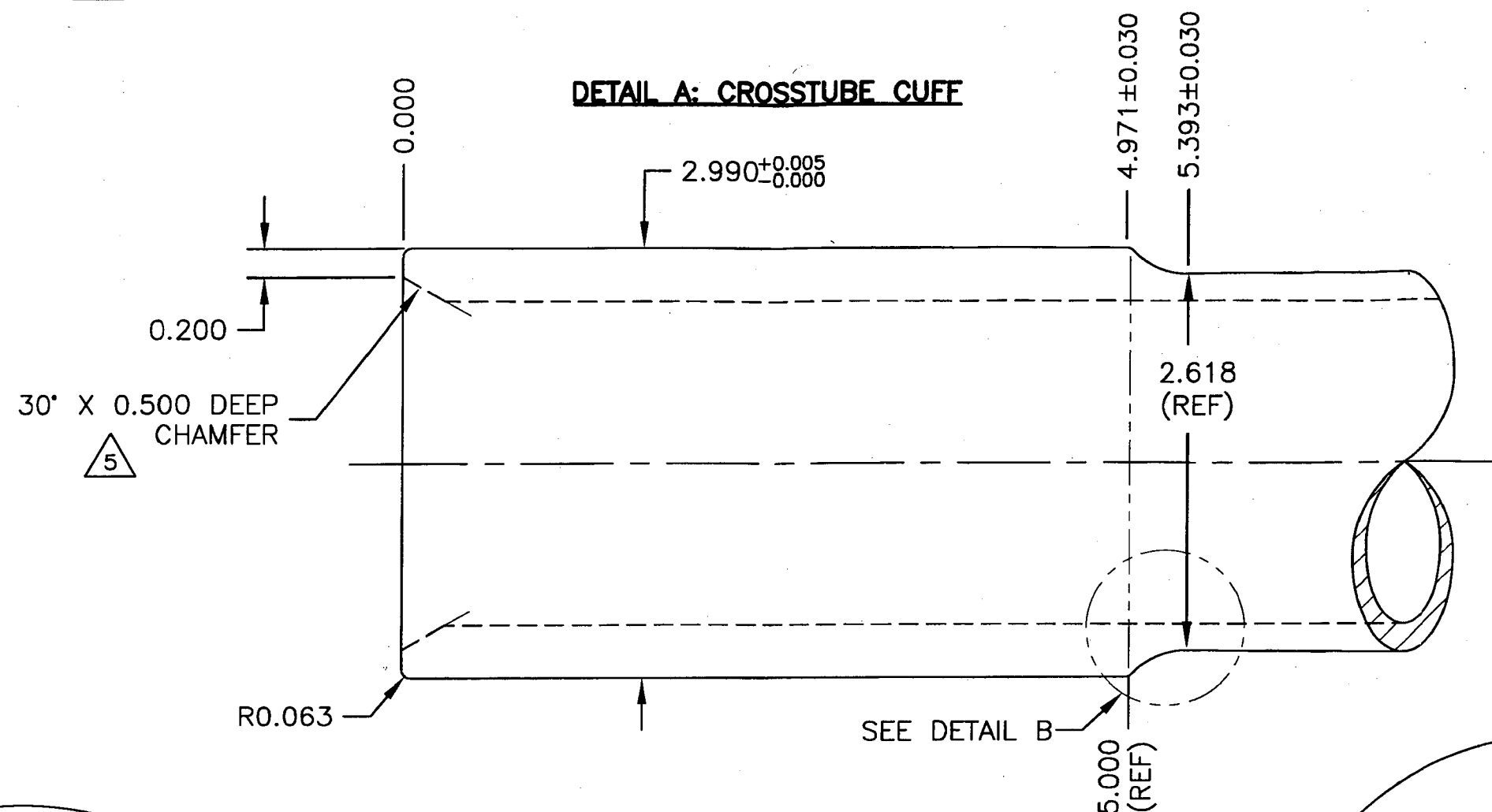




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WITHOUT NOTICE  
WORK ORDER  
NO. 39112

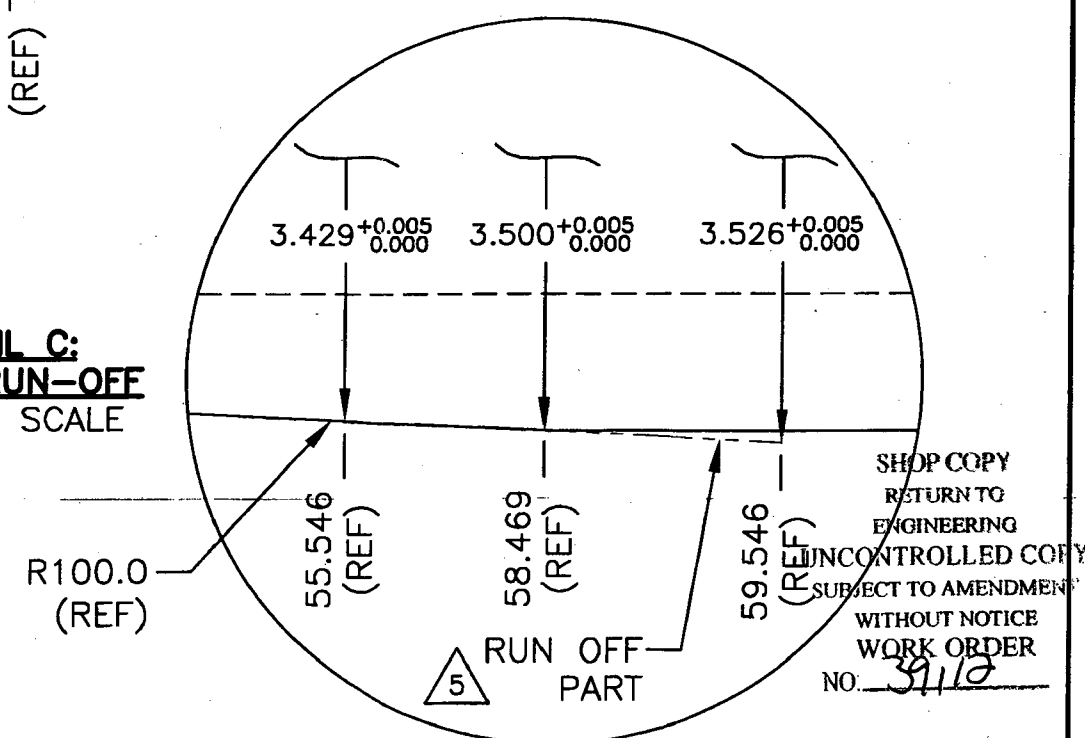
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THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.		PH	PH	DRAWING NO.	REV. D
		GP	GP	D412-664-243	SHEET 2 OF 3
		DATE	TITLE	SCALE	
		07.03.09	CROSSTUBE ASSEMBLY (412 HI AFT)	1:10	

**RELEASED**  
07.04.244P  
PER ECN 937



**DETAIL B: CUFF TRANSITION**  
SCALE 4:1

**DETAIL C: TAPER RUN-OFF**  
NOT TO SCALE



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